

Mirkó Palla, PhD

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Mission:

By developing novel high-throughput and multiplex tools as a junior faculty, I hope to greatly expedite new insights into a wide variety of biological system studies based on single-molecule enzyme activity screens and create foundationally disruptive technologies for DNA reading and writing.

Education:

- 2014-2019 **Harvard Medical School** – Boston, MA
Postdoctoral Fellow, Department of Genetics & Wyss Institute
Advisor: Professor George M. Church
- 2008-2014 **Columbia University** – New York, NY
Doctor of Philosophy, Department of Mechanical Engineering
Advisor: Professor Jingyue Ju
- 2005-2007 **Clarkson University** – Potsdam, NY
Bachelor of Science with Great Distinction, Department of Mechanical Engineering
GPA: 3.92/4.00 – top of the class
- 2005-2006 **Harvard University** – Cambridge, MA
Graduate course: Computational and Functional Genomics, Biophysics Program
- 2002-2004 **State University of New York College at Potsdam** – Potsdam, NY
Double Major: Physics and Mathematics; Minor: Computer Science
GPA: 3.95/4.00

Awards and Honors:

- 2018 Financial Award Recipient, 10th Workshop on Single Molecule Biophysics (SMB2019)
- 2017 Best Poster Award, Harvard Medical School, Annual Genetics Retreat
- 2016 Travel Grant Recipient, Chemical and Biological Microsystems Society, MicroTAS 2016
- 2015 Best Conference Proceedings, Technical Committee Nomination, IEEE SENSORS 2015
- 2010-2012 Graduate Research Assistant Award, Columbia University, full tuition coverage
- 2007 Norman L. Rea Award for Excellence in Mechanical Engineering, Clarkson University
- 2005-2007 Honors and International Scholarship Recipient, Clarkson University
- 2004 Presidential Scholar Research Grant in Bioinformatics, SUNY Potsdam
- 2004 Winner of the Charlie Smith Award for Excellence in Mathematics, SUNY Potsdam
- 2003 Departmental Award for Academic Excellence in Chemistry, SUNY Potsdam

Professional Service and Activities:

- 2019-present Invited reviewer, Biophysical Journal
- 2018-present Invited judge, Annual National Collegiate Research Conference (NCRC)
- 2017-present Reviewer for the IEEE Conference on Sensors (IEEE SENSORS)
- 2017-present Invited reviewer, IEEE Sensors Letters
- 2016-present Invited reviewer, IEEE Life Science Letters
- 2015-present GSAS Harvard Biotechnology Club Member
- 2011-2014 Harlem Biospace (Hb) Biotech Incubator Community Member
- 2011-2014 Columbia Engineering Entrepreneurship Mentoring Program
- 2011 TEDx Columbia Engineering Programming and Speaker Selection Committee

Teaching and Mentoring:

- 2015-2019 Research Supervisor, Wyss Institute of Biologically Inspired Engineering
Valentin Dubois, HMS/MIT Postdoctoral Fellow (2017-present)
Sukanya Punthambaker, HMS/Wyss Postdoctoral Fellow (2016-present)
Neta Raab, Visiting Scholar (Bar-Ilan University, Israel)
Daniel Wiegand, Wyss Research Assistant (2015-2016)
Michael Tung, Wyss Research Assistant (2014-2015)
- 2014-2015 Minority Access Program (MAP) Mentor, Harvard Medical School
Abbas Adris, George Washington University undergraduate (Summer 2015)
Aman Aberra, Arizona State University undergraduate (Summer 2014)
- 2012-2014 Undergraduate Tutor, Department of Applied Mathematics, Columbia University
2005-2007 Tutor, Collegiate Science and Technology Entry Program (CSTEP), Clarkson University
2004-2005 Coordinator/Counselor, CSTEP Jumpstart Summer Program, SUNY Potsdam
2003-2005 Teaching Assistant, Department of Physics, SUNY Potsdam
Teaching Assistant, Department of Computer Science, SUNY Potsdam
Peer Tutor in Mathematics, Student Success Center, SUNY Potsdam

Entrepreneurship:

- 10/2018 Tech Xperience Week, Brainport Eindhoven – Eindhoven, The Netherlands
09/2017 Bayer LifeHub Hackathon: Hacking Farming, IDEO Cambridge – Cambridge, MA
06/2016 Harvard vs. MIT Case Competition, MIT – Cambridge, MA
04/2015 Grand Hack: MIT Hacking Medicine, MIT Media Lab – Cambridge, MA

Career Development:

- 06/2018 Funding Your Research: NIH Course, HMS – Boston, MA
06/2018 Leadership Strategies for the Researcher Course, HMS – Boston, MA
05/2017 Successful Grant Writing Strategies Course, Harvard University – Cambridge, MA
01/2017 Patent Law Essentials Workshop, MIT – Cambridge, MA
09/2016 Healthcare Innovation & Commercialization Course, HMS – Boston, MA
05/2016 Medical Device Development Course, HMS – Boston, MA

Grant Writing Contributions:

Grant Number: R01 RFA-HG-18-001 | Project Date: 4/1/2019 - 3/31/2023 | Submitted
Proposed Amount: **\$2,653,111**

Funding Agency: National Human Genome Research Institute, National Institutes of Health
Title: “Single-Molecule Electronic Nucleic Acid Sequencing-by-Synthesis Using Novel Tagged Nucleotides and Nanopore Constructs” (PI: J. Ju, G.M. Church)

Grant Number: IARPA-BAA-18-03 | Project Date: 01/01/2019 – 01/31/2023 | Submitted
Proposed Amount: **\$5,251,675**

Funding Agency: Intelligence Advanced Research Projects Activity, MIST Program
Title: “Flexible-write information storage in DNA” (PI: G. Church, H. Lee)

Grant Number: HR001118S0023 | Project Date: 11/01/2018 – 10/31/2022 | Funded (Phase II)
Proposed Amount: **\$1,950,004**

Funding Agency: Defense Advanced Research Projects Agency, Biological Technologies Office
Title: “Epigenetic CHaracterization and Observation” (PI: S.C. Sealfon, G.M. Church)

Grant Number: MCB-1445570 | Project Date: 08/01/2014 – 07/31/2017 | Completed

Awarded Amount: **\$334,523**

Funding Agency: Division of Molecular and Cellular Bioscience, National Science Foundation

Title: “ERASynBio: Intensification of the Synthetic Biology Design Cycle” (PI: G.M. Church)

Grant Number: R01 HG007415-02 | Project Date: 09/01/2013 – 07/31/2016 | Completed

Awarded Amount: **\$5,171,249**

Funding Agency: National Human Genome Research Institute, National Institutes of Health

Title: “An Integrated System for Single Molecule Electronic Sequencing by Synthesis” (PI: J. Ju)

Publications:

Link to 12 publications: <https://scholar.google.com/citations?user=3v2VglcAAAAJ&hl=en>

Total citations of all work: 226 (Google Scholar accessed 03/19/2019)

Research Investigations:

M. Palla*, S. David B. Thompson*, G.M. Church. (2018) Single-Molecule Characterization of a Nanopore-Coupled Cas9 Protein on an Electrode Array, IEEE Xplore, 8630288.

M. Palla*, S. Punthambaker*, P.B. Stranges, F. Vigneault, J. Nivala, A. Ayer, T. Craig, D. Gremyachinskiy, H. Franklin, S. Sun, J. Pollard, A. Trans, A. Qwan, C.W. Fuller, S. Roevers, G.M. Church. (2018) Multiplex Single-Molecule Kinetics of Nanopore-Coupled Polymerases. Nature Communications, in revision.

M. Palla, Z. Li, S. Jockusch, F.G. Bosco, T. Rindzevicius, M.S. Schmidt, J.J. Russo, A. Boisen, J. Ju. (2017) Click Chemistry Based Biomolecular Conjugation Monitoring Using Surface-Enhanced Raman Spectroscopy Mapping. IEEE Xplore, 7808595.

P.B Stranges*, **M. Palla***, S. Kalachikov, J. Nivala, M. Dorwart, A. Trans, S. Kumar, M. Porel, M. Chien, C. Tao, I. Morozova, Z. Li, S. Shi, A. Aberra, C. Spilman, A. Yang, A. Aguirre, T. Harada, D. Korenblum, J. Pollard, A. Bibillo, R. Chen, R. Davis, J.J. Russo, C. Fuller, S. Roevers, J. Ju, G.M. Church. (2016) Design and Characterization of a Nanopore-Coupled Polymerase for Single Molecule DNA Sequencing by Synthesis on an Integrated Electronic Array. PNAS, 44, E6749–E6756.

C.W. Fuller, S. Kumar, M. Porel, M. Chien, A. Bibillo, P.B. Stranges, M. Dorwart, C. Tao, Z. Li, W. Guo, S. Shi, D. Korenblum, A. Trans, A. Aguirre, E. Liu, T. Harada, J. Pollard, J. Hu, C. Cech, A. Yang, C. Spilman, **M. Palla**, R. Chen, I. Morozova, S. Kalachikov, J.J. Russo, J. Kasianowicz, G.M. Church, R. Davis, J. Ju. (2016) Real-Time, Single Molecule Electronic DNA Sequencing by Synthesis on a Nanopore Array. PNAS, 19, 5233–5238.

M. Palla*, F.G. Bosco*, J. Yang*, T. Rindzevicius, T.S. Alstrom, M.S. Schmidt, Q. Lin, A. Boisen, J. Ju. (2015) Mathematical Model for Biomolecular Quantification Using Large-Area Surface-Enhanced Raman Spectroscopy Mapping. RSC Advances, 5, 85845-85853.

M. Palla, W. Guo, S. Shi, Z. Li, J. Wu, S. Jockusch, C. Guo, J.J. Russo, N.J. Turro, J. Ju. (2014) DNA Sequencing by Synthesis Using 3'-O-Azidomethyl Nucleotide Reversible Terminators and Surface-Enhanced Raman Spectroscopic Detection. RSC Advances, 4, 49342–49346.

J. Zhu, C. Qiu*, **M. Palla***, J. Russo, J. Ju, Q. Lin. (2014) A Microfluidic Device for Multiplex Single Nucleotide Polymorphism Genotyping. RSC Advances, 4, 4269-4277.

*Denotes equal contribution.

Y. Zhang, **M. Palla**, A. Sun, J.-C. Liao. (2013) Identification of Unique Interactions between the Flexible Linker and the RecA-Like Domains of DEAD-Box Helicase Mss116. Journal of Physics: Condensed Matter, 25, 374101.

J. Yang*, **M. Palla***, F.G. Bosco*, M.S. Schmidt, A. Boisen, J. Ju, Q. Lin. (2013) A SERS-based Quantitative Bioassay on Aptamer-functionalized Nanopillars Using Large-area Raman Mapping. ACS Nano, 7, 5350–5359.

J. Zhu, **M. Palla**, S. Ronca, R. Warpner, J. Ju, Q. Lin. (2013) A MEMS-based Approach to Single Nucleotide Polymorphism Genotyping. Sensors and Actuators A: Physical, 195, 175–182.

M. Palla, C.-P. Chen, Y. Zhang, J.L. Li, J. Ju, J.-C. Liao. (2013) Mechanism of Flexibility Control for ATP Access of Hepatitis C virus NS3 Helicase. Journal of Biomolecular Structure and Dynamics, 31, 129-141.

M. Palla, D. Pe'er. (2007) Genetomic Promototypes: High-throughput, Computational Design of Synthetic Promoter Regions. Honors Thesis, Clarkson University – Potsdam, NY.

Conference Presentations:

The 10th Workshop on Single Molecule Biophysics (SMB2019) – Aspen, CO. January 2019.
Talk: “Single-Molecule Kinetic Screen of DNA Polymerase Libraries on a Nanopore Array”

Gordon Research Conference & Seminar on Single Molecule Approaches to Biology – Mount Snow, VT. July 2018.

Poster: “Single-Molecule Characterization of a Nanopore-Coupled Cas9 Protein on an Electrode Array”

Biophysical Society 62nd Annual Meeting – San Francisco, CA. February 2018.
Poster: “Multiplex Single-Molecule Kinetics of Nanopore-Coupled Polymerases”

The 21st International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2017) – Savannah, GA. October 2017.
Talk: “Single Molecule Kinetic Profiling of Polymerases on a Nanopore Array”

The 15th IEEE Conference on Sensors (IEEE SENSORS 2016) – Orlando, FL. October 2016.
Talk: “Click Chemistry Based Biomolecular Conjugation Monitoring Using Surface-Enhanced Raman Spectroscopy Mapping”

The 20th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2016) – Dublin, Ireland. October 2016.
Talk: “Design and Characterization of A Nanopore-Coupled Polymerase for Single Molecule DNA Sequencing by Synthesis on an Integrated Electronic Array”

IARPA/SRC Workshop on DNA-based Massive Information Storage – Arlington, VA. April 2016.
This invitation-only workshop explored the near-term feasibility of developing a massive information storage technology based on DNA organizing principles.

The 14th IEEE Conference on Sensors (IEEE SENSORS 2015) – Busan, South Korea. November 2015. Selected as top 10% of all conference proceedings.
Poster: “Mathematical Model for Biomolecular Quantification Using Large-Area Surface-Enhanced Raman Spectroscopy Mapping”

National Human Genome Research Institute (NHGRI) Advanced DNA Sequencing Technology Development Meeting – San Diego, CA. May 2015.
Poster: “Single Molecule DNA Sequencing using Electronic Sensory Arrays with Biological Nanopore-bound Polymerase”

The 17th International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS & EUROSensors XXVII) – Barcelona, Spain. June 2013.

Talk: “A Microfluidic Surface Enhanced Raman Spectroscopic Biosensor Using Aptamer Functionalized Nanopillars”

244th ACS National Meeting and Exposition – Philadelphia, PA. August 2012.

Poster: “DNA Sequencing by Synthesis Using Surface-Enhanced Raman Spectroscopy”

The 25th International Conference on Micro Electro Mechanical Systems (IEEE MEMS 2012) – Paris, France. February 2012.

Poster: “A MEMS-based Approach to Detection of Single Nucleotide Polymorphisms for Genetic Disorder Diagnosis”

The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2011) – Seattle, WA. October 2011.

Poster: “A Microfluidic Device for Detection of Single Nucleotide Polymorphisms by Allele Specific Single Base Extension”

Biophysical Society 55th Annual Meeting – Baltimore, MD. May 2011.

Poster: “Mechanism of Flexibility Control for ATP Access of Hepatitis C Virus NS3 Helicase”

Patents:

Church GM, **Palla M**, Thompson DB, inventors; Harvard College, assignee. Nanopore-based Cas9 profiling for genome engineering. Harvard Docket No. 6685. 2018 January 5.

Ayer A, Church GM, **Palla M**, Pepin F, Punthambaker S, Stranges PB, inventors; Roche Sequencing Solutions Inc, Roche Diagnostics GmbH, F. Hoffmann-Laroché Ag, Harvard College, assignee. Enzyme screening methods. WIPO Patent Application No. 2019/040546 A1. 2019 February 28.

Church GM, Nivala J, **Palla M**, Stranges PB, inventors; Harvard College, assignee. Method and system of nanopore-based information encoding. WIPO Patent Application No. 2017/184677. 2017 October 26.

Church GM, Lee H, **Palla M**, inventors; Harvard College, assignee. Method of making polynucleotides using an anion toroidal vortex. WIPO Patent Application No. 2017/142913 A1. 2017 August 24.

Ju J, Kumar S, **Palla M**, Russo J, inventors; The Trustees of Columbia University in the City of New York, assignee. Raman cluster tagged molecules for biological imaging. WIPO Patent Application No. 2014/144883 A1. 2014 September 18.

Lin Q, Boisen A, Yang J, **Palla M**, Bosco FG, Schmidt MS, Rindzevicius T, Stojanovic MN, Ju J, inventors; The Trustees of Columbia University in the City of New York, assignee. Large-area mapping of uniform SERS-active substrate for reliable, sensitive and specific detection of biomolecules. U.S. Provisional Application No. 61/813,060. 2013 April 17.

Lin Q, Zhu J, Qiu C, **Palla M**, Ju J, inventors; The Trustees of Columbia University in the City of New York, assignee. A microfluidic device for detection of single nucleotide polymorphisms by allele specific single base extension. U.S. Provisional Application No. 61/542,124. 2011 September 30.

Press Coverage:

Johnson, Dexter (October 13, 2016). [“Personalized Medicine Draws Closer With Cheap and Accurate DNA Sequencer”](#) (Press release). New York, NY: **IEEE Spectrum**.

Boettner, Benjamin (October 11, 2016). [“Poring over DNA”](#) (Press release). Washington, DC: **EurekAlert!**/American Association for the Advancement of Science (AAAS).